

11-28-00

A

PTO/SB/05 MODIFIED BY AT&T CORP.

11/28/00

JC945 U.S. PTO

UTILITY

PATENT APPLICATION
TRANSMITTAL

(For new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

2000-0062

Total Pages

29

First Named Inventor or Application Identifier

Kevin M. Boyd et al.

Express Mail Label No.

EL700776867US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

1. ☒ Fee Transmittal Form
(submit an original, and a duplicate for fee processing)
2. ☒ Specification [Total Pages 17]
(preferred arrangement set forth below)
- Descriptive title of invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R&D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings(if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s)(35 USC 113) [Total Sheets 6]
4. Oath or Declaration [Total Pages 3]
- a. ☐ Newly executed (original or copy)
 - b. ☐ Copy from a prior application(37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 5 below]
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s)
named in the prior application, see 37 CFR
1.63(d)(2) and 1.33(b)
5. ☐ Incorporation by reference(useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath
or declaration is supplied under Box 4b, is considered as being part of the
disclosure of the accompanying application and is hereby incorporated by
reference herein.

6. ☐ Microfiche Computer Program (Appendix)
7. ☐ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
 - b. ☐ Paper Copy(identical to computer copy)
 - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☐ Assignment Papers(cover sheet & document(s))
9. ☐ 37 CFR 3.73(b)Statement ☐ Power of Attorney
10. ☐ English Translation Document (if applicable)
11. ☒ Information Disclosure ☒ Copies of IDS
Statement(IDS)PTO-1449 Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
14. ☐ Small Entity ☐ Statement filed in prior application,
Statement(s) Status still proper and desired
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Other :

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior Application No:

18. CORRESPONDENCE ADDRESS

☐ Customer Number or Bar Code Label

(Insert Customer No. or Attach bar code label here)

or ☒ Correspondence address below

NAME	Samuel H. Dworesky				
ADDRESS	AT&T CORP., P.O.BOX 4110				
CITY	MIDDLETOWN	STATE	NEW JERSEY	ZIP CODE	07748-4801
COUNTRY	UNITED STATES				FAX 732-957-5505

19. SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

NAME	Samuel H. Dworesky	Reg. #	27873
TELEPHONE	908-221-5234		
SIGNATURE	[Signature]		DATE
			Nov. 28, 2000

"Express Mail" Mailing Label Number EL700776867US

Date of Deposit 11/28/00

I hereby certify that this Application

Is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and
is addressed to the Assistant Commissioner of Patents, Washington D.C., 20231

Nicole Barrett

(Printed Name of Person Mailing Paper)

(Signature of Person Mailing Paper)

DUPLICATE

Please type a plus sign(+) inside this box → ☐

PTO/SB/17 Modified 02-98 AT&T Corp.

<h2 style="text-align: center;">FEE TRANSMITTAL</h2> <p style="text-align: center;">Patent Fees are subject to annual revision on October 1. These are the fees effective October 1, 1997. Small Entity payments <u>must</u> be supported by a small entity Statement, otherwise, large entity fees must be paid. See Forms PTO/SB/09-12.</p>		Complete if Known	
		Application Number	
		Filing Date	
		First Named Inventor	Kevin M. Boyd et al
		Examiner Name	
		Group/Art Unit	
TOTAL AMOUNT OF PAYMENT	(\$ 710.00	Attorney Docket No.	2000-0062

METHOD OF PAYMENT (check one)		FEE CALCULATION (continued)																																																																																																																											
<p>1. The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:</p> <p>Deposit Account Number 01-2745</p> <p>Deposit Account Name AT&T CORP.</p> <p><input checked="" type="checkbox"/> Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 <input type="checkbox"/> Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance</p>		<h3>3. ADDITIONAL FEES</h3> <table border="1"> <thead> <tr> <th>Large Fee Code</th> <th>Entity Fee(\$)</th> <th>Fee Description</th> <th>Fee Paid</th> </tr> </thead> <tbody> <tr><td>105</td><td>130</td><td>Surcharge - late filing fee or oath</td><td></td></tr> <tr><td>127</td><td>50</td><td>Surcharge - late provisional filing fee or cover sheet</td><td></td></tr> <tr><td>139</td><td>130</td><td>Non-English specification</td><td></td></tr> <tr><td>147</td><td>2520</td><td>For filing a request for reexamination</td><td></td></tr> <tr><td>112</td><td>920*</td><td>Requesting publication of SIR prior to Examiner action</td><td></td></tr> <tr><td>113</td><td>1840*</td><td>Requesting publication of SIR after to Examiner action</td><td></td></tr> <tr><td>115</td><td>110</td><td>Extension for reply within first month</td><td></td></tr> <tr><td>116</td><td>400</td><td>Extension for reply within second month</td><td></td></tr> <tr><td>117</td><td>950</td><td>Extension for reply within third month</td><td></td></tr> <tr><td>118</td><td>1510</td><td>Extension for reply within fourth month</td><td></td></tr> <tr><td>128</td><td>2060</td><td>Extension for reply within fifth month</td><td></td></tr> <tr><td>119</td><td>310</td><td>Notice of Appeal</td><td></td></tr> <tr><td>120</td><td>310</td><td>Filing a brief in support of an appeal</td><td></td></tr> <tr><td>121</td><td>270</td><td>Request for oral hearing</td><td></td></tr> <tr><td>138</td><td>1510</td><td>Petition to institute a public use proceeding</td><td></td></tr> <tr><td>140</td><td>110</td><td>Petition to revive - unavoidable</td><td></td></tr> <tr><td>141</td><td>1320</td><td>Petition to revive - unintentional</td><td></td></tr> <tr><td>142</td><td>1320</td><td>Utility issue fee (or reissue)</td><td></td></tr> <tr><td>143</td><td>450</td><td>Design issue fee</td><td></td></tr> <tr><td>144</td><td>670</td><td>Plant issue fee</td><td></td></tr> <tr><td>122</td><td>130</td><td>Petitions to the Commissioner</td><td></td></tr> <tr><td>123</td><td>50</td><td>Petitions related to provisional applications</td><td></td></tr> <tr><td>126</td><td>240</td><td>Submission of Information Disclosure Statement</td><td></td></tr> <tr><td>581</td><td>40</td><td>Recording each patent assignment per property(times number of properties)</td><td></td></tr> <tr><td>146</td><td>790</td><td>Filing a submission after final rejection(37 CFR 1.129(a))</td><td></td></tr> <tr><td>149</td><td>790</td><td>For each additional invention to be examined (37 CFR 1.129(b))</td><td></td></tr> <tr><td colspan="3">Other fee (specify)</td><td></td></tr> <tr><td colspan="3">Other fee (specify)</td><td></td></tr> <tr> <td colspan="3">* Reduced by Basic Filing Fee Paid</td> <td>SUBTOTAL(3)</td> </tr> </tbody> </table>				Large Fee Code	Entity Fee(\$)	Fee Description	Fee Paid	105	130	Surcharge - late filing fee or oath		127	50	Surcharge - late provisional filing fee or cover sheet		139	130	Non-English specification		147	2520	For filing a request for reexamination		112	920*	Requesting publication of SIR prior to Examiner action		113	1840*	Requesting publication of SIR after to Examiner action		115	110	Extension for reply within first month		116	400	Extension for reply within second month		117	950	Extension for reply within third month		118	1510	Extension for reply within fourth month		128	2060	Extension for reply within fifth month		119	310	Notice of Appeal		120	310	Filing a brief in support of an appeal		121	270	Request for oral hearing		138	1510	Petition to institute a public use proceeding		140	110	Petition to revive - unavoidable		141	1320	Petition to revive - unintentional		142	1320	Utility issue fee (or reissue)		143	450	Design issue fee		144	670	Plant issue fee		122	130	Petitions to the Commissioner		123	50	Petitions related to provisional applications		126	240	Submission of Information Disclosure Statement		581	40	Recording each patent assignment per property(times number of properties)		146	790	Filing a submission after final rejection(37 CFR 1.129(a))		149	790	For each additional invention to be examined (37 CFR 1.129(b))		Other fee (specify)				Other fee (specify)				* Reduced by Basic Filing Fee Paid			SUBTOTAL(3)
Large Fee Code	Entity Fee(\$)	Fee Description	Fee Paid																																																																																																																										
105	130	Surcharge - late filing fee or oath																																																																																																																											
127	50	Surcharge - late provisional filing fee or cover sheet																																																																																																																											
139	130	Non-English specification																																																																																																																											
147	2520	For filing a request for reexamination																																																																																																																											
112	920*	Requesting publication of SIR prior to Examiner action																																																																																																																											
113	1840*	Requesting publication of SIR after to Examiner action																																																																																																																											
115	110	Extension for reply within first month																																																																																																																											
116	400	Extension for reply within second month																																																																																																																											
117	950	Extension for reply within third month																																																																																																																											
118	1510	Extension for reply within fourth month																																																																																																																											
128	2060	Extension for reply within fifth month																																																																																																																											
119	310	Notice of Appeal																																																																																																																											
120	310	Filing a brief in support of an appeal																																																																																																																											
121	270	Request for oral hearing																																																																																																																											
138	1510	Petition to institute a public use proceeding																																																																																																																											
140	110	Petition to revive - unavoidable																																																																																																																											
141	1320	Petition to revive - unintentional																																																																																																																											
142	1320	Utility issue fee (or reissue)																																																																																																																											
143	450	Design issue fee																																																																																																																											
144	670	Plant issue fee																																																																																																																											
122	130	Petitions to the Commissioner																																																																																																																											
123	50	Petitions related to provisional applications																																																																																																																											
126	240	Submission of Information Disclosure Statement																																																																																																																											
581	40	Recording each patent assignment per property(times number of properties)																																																																																																																											
146	790	Filing a submission after final rejection(37 CFR 1.129(a))																																																																																																																											
149	790	For each additional invention to be examined (37 CFR 1.129(b))																																																																																																																											
Other fee (specify)																																																																																																																													
Other fee (specify)																																																																																																																													
* Reduced by Basic Filing Fee Paid			SUBTOTAL(3)																																																																																																																										
<p>2. <input type="checkbox"/> Payment Enclosed: <input type="checkbox"/> Check <input type="checkbox"/> Money Order <input type="checkbox"/> Other</p>																																																																																																																													
FEE CALCULATION																																																																																																																													
<p>1. FILING FEE</p> <table border="1"> <thead> <tr> <th>Large Fee Code</th> <th>Entity Fee(\$)</th> <th>Fee Description</th> <th>Fee Paid</th> </tr> </thead> <tbody> <tr><td>101</td><td>7.0</td><td>Utility Filing Fee</td><td>710.00</td></tr> <tr><td>106</td><td>330</td><td>Design Filing Fee</td><td></td></tr> <tr><td>107</td><td>540</td><td>Plant Filing Fee</td><td></td></tr> <tr><td>108</td><td>790</td><td>Reissue Filing Fee</td><td></td></tr> <tr><td>114</td><td>150</td><td>Provisional Filing Fee</td><td></td></tr> <tr> <td colspan="3">SUBTOTAL (1) (\$)</td> <td>710.00</td> </tr> </tbody> </table>		Large Fee Code	Entity Fee(\$)	Fee Description	Fee Paid	101	7.0	Utility Filing Fee	710.00	106	330	Design Filing Fee		107	540	Plant Filing Fee		108	790	Reissue Filing Fee		114	150	Provisional Filing Fee		SUBTOTAL (1) (\$)			710.00																																																																																																
Large Fee Code	Entity Fee(\$)	Fee Description	Fee Paid																																																																																																																										
101	7.0	Utility Filing Fee	710.00																																																																																																																										
106	330	Design Filing Fee																																																																																																																											
107	540	Plant Filing Fee																																																																																																																											
108	790	Reissue Filing Fee																																																																																																																											
114	150	Provisional Filing Fee																																																																																																																											
SUBTOTAL (1) (\$)			710.00																																																																																																																										
<p>2. CLAIMS</p> <table border="1"> <thead> <tr> <th></th> <th>Extra Claims</th> <th>Fee from below</th> <th>Fee Paid</th> </tr> </thead> <tbody> <tr> <td>Total Claims 15 -</td> <td>X</td> <td>=</td> <td>0</td> </tr> <tr> <td>Independent Claims 2 -</td> <td>X</td> <td>=</td> <td>0</td> </tr> <tr> <td>Multiple Dependent Claims</td> <td></td> <td>=</td> <td></td> </tr> </tbody> </table>			Extra Claims	Fee from below	Fee Paid	Total Claims 15 -	X	=	0	Independent Claims 2 -	X	=	0	Multiple Dependent Claims		=																																																																																																													
	Extra Claims	Fee from below	Fee Paid																																																																																																																										
Total Claims 15 -	X	=	0																																																																																																																										
Independent Claims 2 -	X	=	0																																																																																																																										
Multiple Dependent Claims		=																																																																																																																											
<table border="1"> <thead> <tr> <th>Large Fee Code</th> <th>Entity Fee(\$)</th> <th>Fee Description</th> </tr> </thead> <tbody> <tr><td>103</td><td>22</td><td>Claims in excess of 20</td></tr> <tr><td>102</td><td>82</td><td>Independent Claims in excess of 3</td></tr> <tr><td>104</td><td>270</td><td>Multiple Dependent Claims</td></tr> <tr><td>109</td><td>82</td><td>Reissue independent claims over original patent</td></tr> <tr><td>110</td><td>22</td><td>Reissue claims in excess of 20 and over original patent</td></tr> <tr> <td colspan="2">SUBTOTAL (2) (\$)</td> <td>0</td> </tr> </tbody> </table>		Large Fee Code	Entity Fee(\$)	Fee Description	103	22	Claims in excess of 20	102	82	Independent Claims in excess of 3	104	270	Multiple Dependent Claims	109	82	Reissue independent claims over original patent	110	22	Reissue claims in excess of 20 and over original patent	SUBTOTAL (2) (\$)		0																																																																																																							
Large Fee Code	Entity Fee(\$)	Fee Description																																																																																																																											
103	22	Claims in excess of 20																																																																																																																											
102	82	Independent Claims in excess of 3																																																																																																																											
104	270	Multiple Dependent Claims																																																																																																																											
109	82	Reissue independent claims over original patent																																																																																																																											
110	22	Reissue claims in excess of 20 and over original patent																																																																																																																											
SUBTOTAL (2) (\$)		0																																																																																																																											

SUBMITTED BY		Complete (if applicable)	
Typed or Printed Name	Samuel H. Dvorsky	Reg. Number	27873
Signature		Date	11/28/00
		Deposit Account User ID	

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, D.C. 20231

**METHOD AND APPARATUS FOR EFFICIENT SHARING OF
COMMUNICATION SYSTEM RESOURCES**

RELATED PATENT APPLICATION

5

This patent application claims benefit of U.S. Provisional Application No. 60/181,014, filed on February 08, 2000 and entitled "Multiple Access Scheme For Communications Systems With Delayed Flags."

10

BACKGROUND

1. Field of the Invention

The invention relates generally to a system having a channel that is accessed by a plurality of remote units. More specifically, the invention relates to a method of
15 accessing the plurality of remote units.

2. Background of the Invention

Wireless local loop technology is becoming an increasingly popular means for
20 providing communication services such as telephony, data services and television programming. A fixed wireless loop network includes a plurality of base stations. Each base station is in wireless communication with a plurality of remote units which are typically located at the premises of an end user where they are connected to the premises equipment such as telephones, computers and faxes. The premises equipment receives
25 communication services over a wireless link between the base station and the remote unit.

Two or more of the remote units typically transmit data to a base station on a reverse channel. When more than one remote unit has data to transmit to the base station, they may try to concurrently access the reverse channel. When more than one remote unit transmits on the reverse channel, a collision results. A collision prevents data from any of
30 the remote units from being successfully decoded at the base station, thus reducing the

efficiency of fixed wireless loop telecommunication systems. As a result, there is a need for controlling access to a reverse channel so as to reduce the number of collisions.

SUMMARY OF THE INVENTION

5

The invention relates to a method for accessing a reverse channel for communication from a remote unit to a base station. The method includes waiting a random period of time in response to determining that the reverse channel is available at a first time. The method also includes monitoring a forward channel after expiration of the random period of time to determine whether the reverse channel is available at a second time. The method further includes transmitting a first portion of data on the reverse channel in response to determining that the reverse channel is available at the second time.

The method can also include transmitting from the remote unit to the base station a second portion of the data on the reverse channel in response to determining that transmitting the first portion of data caused the remote unit to access the reverse channel.

Determining whether the remote unit has accessed the reverse channel can include determining whether the reverse channel stayed available from when the first portion of data was transmitted until a round-trip time had passed. The round-trip time is the time required for a transmission on the reverse channel to be evident on a forward channel.

Determining whether the remote unit has accessed the reverse channel can include determining whether the reverse channel is available at a round-trip time after transmitting the first portion of data. The round-trip time is the time required for a transmission on the reverse channel to be evident on the forward channel.

Determining whether the remote unit has accessed the reverse channel can include determining whether the base station successfully decoded the first portion of data.

The invention also relates to a method for accessing a reverse channel for providing communication from a remote unit to a base station. The method includes executing a channel access method to access the reverse channel and waiting a second random time in response to the channel access method failing to provide access to the

reverse channel. The method also includes re-executing the channel access method in response to a determination that the reverse channel is not available after passage of the second random time.

5

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a communication system including a base station in wireless communication with a plurality of remote units;

Figure 2 illustrates communication between a base station and a remote unit on a
10 forward channel and a reverse channel;

Figure 3 illustrates a first remote unit and a second remote unit trying to access the reverse channel;

Figure 4 illustrates an example of a channel access method;

Figure 5 illustrates an example of an access check method for determining
15 whether a remote unit has accessed a reverse channel; and

Figure 6 illustrates an access failure method which is executed by the remote unit after the channel access method fails to provide the remote unit with access to the reverse channel.

20

DETAILED DESCRIPTION

The invention relates to a communication system having a reverse channel which is accessed by a plurality of remote units. When a remote unit has data to be transmitted on the reverse channel, the remote unit executes a channel access method to gain access to
25 the reverse channel. The channel access method includes waiting until the reverse channel is available. When the reverse channel becomes available, the remote unit waits a first random period of time. After the first random period of time has expired, the remote unit determines whether the reverse channel is available. If the reverse channel is available, the remote unit transmits a first portion of the data on the reverse channel.

Waiting a first random period of time before transmitting on the reverse channel reduces the likelihood of collision when multiple remote units are trying to access the channel. If the remote units were to transmit as soon as the channel became available, a collision would result each time more than one remote unit was waiting for the channel to become available. Because the remote units wait a first random period of time before transmitting, the odds of more than one remote unit transmitting at the same time are reduced.

When the method for accessing a channel does not result in the remote unit gaining access to the channel, the remote unit executes an access failure method. The access failure method includes waiting a second random time. If the channel is still unavailable after the second random time, the remote unit re-executes the channel access method.

Figure 1 illustrates an example of a communication system 10 employing one or more base stations 12 and a plurality of remote units 14. The particular system illustrated is a fixed wireless loop network although the invention can be used in conjunction with other systems. A base station 12 is in communication with a local switch 16 which can include, for example, a No. 5 ESS provided by Lucent Technologies. A suitable local switch 16 includes, but is not limited to, a voice switch and a data switch. The base station 12 is also in wireless communication with a plurality of remote units 14 located within the service area of the base station 12.

The base station 12 includes a transmitter and a receiver which act as an air link interface to the remote units 14. The base station 12 also includes certain processing and memory capabilities which provide the remote units 14 with the functionality described in this application.

When the system is a fixed wireless loop network, the remote units 14 can be geographically fixed. For instance, the remote units 14 can be fixed to a premises such as a home or a business. The remote unit 14 can be in communication with a variety of premises communication equipment 18 including, but not limited to, telephones, computers, modems and fax machines.

The remote units 14 also include a transmitter and a receiver which act as an air link interface to the base station 12. The remote units 14 also include processing and memory capabilities that provide the remote units 14 with the functionality described in this application.

5 Figure 2 illustrates communication between a base station 12 and a remote unit 14. The base station communicates with the remote unit over a forward channel 22 and the remote unit communicates with the base station over a reverse channel 24. The communications of the base station on the forward channel 22 can be received and processed by each of the remote units in the system. Each of the remote units
10 communicate with the base station on the same reverse channel.

 The reverse 24 and forward 22 channels are each divided into a plurality of timeslots 26. The reverse channel is illustrated as being divided into eight timeslots 26, T_1 - T_8 . The subscripts 1-8 indicate the chronological order of the time slots. The forward channel 22 is illustrated as being divided into eight timeslots 26, T_A - T_H . The subscripts
15 A-H indicate the chronological order of the time slots. For illustrative purposes, the timeslots 26 on the forward channel 22 are illustrated as occurring in a direction which is opposite to the direction of transmission. Accordingly, timeslot T_A is on the forward channel 22 at substantially the same time as T_1 is on the reverse channel 24.

 The time slots on the forward channel 22 contain at least two bits of information.
20 The bit labeled the B/I (busy/idle) bit provides information as to whether the base station is capable of receiving data in a time slot along the reverse channel. Accordingly, this bit indicates whether the reverse channel is available for use by one of the remote units. For instance, the base station sets the B/I bit to zero when the reverse channel is available and sets the B/I bit to one when the reverse channel is unavailable.

25 The D bit indicates whether the base station has successfully decoded data received in a time slot. A failure to decode received data can result from a collision of two or more remote units transmitting data into the same time slot or from other transmission errors. For the purposes of this application, the base station sets the D bit to zero when the base station has not successfully decoded data received from a remote unit

and sets the D bit to one when the base station has successfully decoded data received from a remote unit.

5 The remote units monitor the B/I bits on the forward channel 22 to determine when to transmit to the base station. When the remote units have data to be transmitted to the base station, the remote units wait until the B/I bit indicates that the reverse channel 24 is available. Once the B/I bit indicates that the reverse channel 24 is available, the remote units with data to be transmitted wait a random period of time after the reverse channel 24 becomes available. After passage of the random period of time, each remote unit determines whether the reverse channel 24 is still available. When the reverse
10 channel 24 is still available, the remote units transmit at least a first portion of the data to be transmitted. Because each remote unit determines the random period of time which it will wait, each remote unit can wait a different period of time before testing whether the reverse channel 24 is still available. When each remote unit waits a different period of time, the opportunity for a collision resulting from concurrent transmission of data is
15 reduced as compared to systems which do not wait a random period of time before transmitting.

The time between a remote unit's transmission of a data package in a time slot on the reverse channel 24 and receipt of a response to that transmission from the base station is referred to as round-trip time. From system to system the "round-trip" time interval
20 may vary depending on the hardware and software implementations. Within a given system, however, this round-trip time interval can be fixed and is known to the base station and the associated remote units.

An example of the round-trip time is illustrated in Figure 2. Since the B/I bit in timeslot T_C indicates that the reverse channel 24 is available, Remote unit 1 (RU_1)
25 transmits data on the reverse channel 24 at timeslot T_3 . The B/I and D bits in the time slots on the forward channel 22 remain as zero for two time slots (T_D and T_E) beyond the time slot in which RU_1 transmits data, T_3 . The transmission on the reverse channel 24 becomes evident on the forward channel 22 at timeslot T_F because the B/I bit and the D bit have been changed from zero to one. Since three timeslots 26 pass between the

transmission of the data on the reverse channel 24 and the transmission becoming evident on the forward channel 22, the round-trip time is three timeslots 26.

5 The timeslot where a remote unit transmits on the reverse channel 24 is called the transmission timeslot. The timeslot on the forward channel 22 at the round-trip time after the transmission timeslot is called the round-trip timeslot. Each transmission timeslot is associated with a round-trip timeslot in that the round-trip timeslot is consulted for data about the data transmitted in the associated transmission timeslot.

10 A remote unit consults the associated round-trip timeslot to determine whether data transmitted in a particular transmission timeslot has been decoded successfully by the base. For instance, when D bit is set to one, the data was successfully decoded. When the D bit is set to zero, the data was not decoded. In view of these conditions, when the first remote unit RU₁ of Figure 2 transmits data at timeslot T₃ and then consults timeslot T_F, the D bit indicates that the data was successfully decoded. However, when a second remote unit RU₂ and a third remote unit RU₃ concurrently transmit data at timeslot T₄ and
15 consult timeslot T_G, the D bit indicate that the data was not successfully decoded. The lack of success results from the collision that occurred when both remote units transmitted concurrently.

20 Figure 3 illustrates a remote unit transmitting a first portion of data at timeslot T₁. The first portion of data can be data that can fit within a single timeslot. The first portion of data at least identifies the remote unit that transmitted the first portion of data. The first portion of data can include any additional data that fits within the timeslot with the identification information. After transmission of the first portion of data, the remote unit performs an access check method to determine whether the remote unit has successfully accessed the reverse channel 24. If the access check method indicates that the remote unit
25 has accessed the reverse channel 24, the remote unit transmits a second portion of the data. However, if the access check method indicates that the remote unit has not accessed the reverse channel 24, the remote unit performs an access failure method.

The access check method can include a determination of whether the first portion of data has been successfully decoded by checking the D bit in the round-trip timeslot as

described above. When the first portion of data is not successfully decoded, the remote unit executes an access failure method.

The access check method can also include determining whether the reverse channel 24 remains available from the transmission timeslot up to the round-trip timeslot.

- 5 If the reverse channel 24 becomes unavailable during any of these timeslots 26, the remote unit executes an access failure method. The access failure method is performed because the reverse channel 24 has been acquired by another remote unit.

- 10 Figure 3 illustrates the forward 22 and reverse 24 channels when more than one remote unit tries to access the reverse channel 24. A second remote unit RU_2 transmits a first portion of data at timeslot T_2 in an attempt to access the reverse channel 24. The second remote unit RU_2 then consults timeslots T_B , T_C and T_D to determine whether the channel became unavailable during any of these timeslots 26. Timeslot T_D indicates that the remote unit became unavailable as a result of a first remote unit RU_1 transmitting a first portion of data at timeslot T_1 . Because the first remote unit RU_1 tried to access the reverse channel 24 before the second remote unit RU_2 , the second remote unit RU_2 defers to the first remote unit by executing an access failure method. In contrast, the first remote unit consults timeslots 26 T_A , T_B and T_C to determine whether the reverse channel 24 has become unavailable. Since the reverse channel 24 remained available and because the round-trip timeslot, T_D , indicates that the base station successfully decoded the first portion of data, the first remote unit transmits a second portion of data starting a timeslot T_4 .
- 15
- 20

- When the entire amount of data to be transmitted from a remote unit is transmitted in a single timeslot, the base station need not indicate that the reverse channel 24 is unavailable. The base station can determine when a single timeslot includes all the data by consulting the header of the transmission where the length of the data is listed. When the data in the timeslot matches the length listed in the header, the base station changes the D bit but does not change the B/I bit. That combination of the B/I bit and the D bit at the round-trip timeslot indicates to the remote unit that the data was properly decoded. However, because the B/I bit indicates that the reverse channel 24 is still available, the transmission will not prevent another remote unit from trying to access the reverse
- 25
- 30

channel 24. For instance, if the first remote unit RU_1 in Figure 3 transmitted data which fit within a single timeslot at timeslot T_1 , the timeslot T_D would show a B/I bit of zero. As a result, the second remote unit RU_2 would transmit the first portion of data at timeslot T_5 .

5 The access failure method can include waiting a second random time. After waiting the second random time, the remote unit makes a determination whether the reverse channel 24 is available by consulting the B/I bit. When the reverse channel 24 is available, the remote unit transmits the first portion of data. When the reverse channel 24 is unavailable, the remote unit waits until it becomes available and waits the first random
10 time. After waiting the first random time, the remote unit determines whether the reverse channel 24 is available by consulting the B/I bit. When the reverse channel 24 is unavailable, the remote unit re-executes the access failure method; and when the reverse channel 24 is available, the remote unit transmits the first portion of data and proceeds as described above.

15 The first random time can be a random time between a first minimum value and a first maximum value. The first minimum value and the first maximum value can be constants or can be variables. The first minimum value can be as low as zero timeslots 26 and the first maximum value can be equal to or greater than the first minimum value. The first minimum value and first maximum value can be administratively entered into the
20 remote units. Alternatively, they can be transmitted from the base station to each of the remote units. Each remote unit can have the same first minimum and the same first maximum value. Alternatively, all or a portion of the remote units can have a different first minimum value and a different first maximum value.

 The second random time can be a random value between a second minimum value
25 and a second maximum value. The second minimum value and the second maximum value can be constants or variables. The second minimum value can be as low as zero timeslots 26 and the second maximum value can be equal to or greater than the second minimum value. The second minimum value can be the same as the first minimum value and/or the second maximum value can be the same as the first maximum value. The
30 second minimum value and second maximum value can be administratively entered into

the remote units. Alternatively, they can be transmitted from the base station to each of the remote units. Each remote unit can have the same second minimum and the same second maximum value. Alternatively, all or a portion of the remote units can have a different second minimum and different second maximum values.

5 The first minimum value, the first maximum value, the second minimum value and the second maximum value can each be a function of system conditions. For instance, the first minimum value, the first maximum value, the second minimum value and the second maximum value can be a function of the number of remote units being served by a base station. In one embodiment, the first maximum value and/or the second maximum value increases as the number of remote units being served increases and decreases as the number of remote units being served decreases. Accordingly, the random delays can have longer durations to account for the larger number of remote units that may be trying to access the channel.

10 In a preferred embodiment, the second maximum value is a function of the number of times that the access failure method has been accessed before the first portion of data is transmitted. In one embodiment, the second maximum value increases for each additional time that the failure access method is accessed before the first portion of data is transmitted. In one embodiment, the second maximum value increases exponentially with the number of times that the access failure method is executed by the remote unit. For instance, the second random time can be between the second minimum value and the second maximum value + c^n , where n is the number of times that the access failure method is accessed and c is a constant which is preferably equal to 2. The first maximum value and c^n each have units of timeslots so that the random time resulting from the relationship is measured in terms of the number of timeslots 26 that the remote unit waits.

25 Figure 4 illustrates an embodiment of a channel access method. Figure 4 also illustrates interaction between the channel access method, an access check method and an access failure method. The channel method begins at start block 200 when the remote unit has been turned on. At process block 202 the remote unit waits until it has data to be transmitted to the base station on a control channel. At process block 204 the remote unit waits until the reverse channel 24 is available. The remote unit determines when the

reverse channel 24 is available by monitoring forward channel 22 until the B/I bit indicates that the reverse channel 24 is available. Once the reverse channel 24 is available, the remote unit waits the first random time at process block 206.

At determination block 208, the remote unit determines whether the reverse channel 24 is still available. This determination is made by consulting the B/I bit once the first random time has expired. When the determination is positive, the remote unit proceeds to process block 210 where it transmits a first portion of the data on the reverse channel 24.

A determination is made whether the remote unit has accessed the reverse channel 24 at determination block 212. Figure 5 provides an example of an access check method for determining whether a remote unit has accessed a reverse channel 24. When the determination at determination block 212 is positive, the remote unit proceeds to process block 214 where it transmits a second portion of the data on the reverse channel 24. At determination block 216, the remote unit determines whether the second portion of data was successfully decoded at the base station. This determination is made by monitoring the D bit in the round-trip timeslots 26 associated with each timeslot where the second portion of data is transmitted. As a result, the remote unit continues to monitor the D bit on the forward channel 22 after the remote unit has stopped transmitting data on the reverse channel 24. The determination is positive unless any of the D bits in the round-trip timeslot indicate that data was not successfully decoded. When the determination is positive, the method terminates at end block 220.

When the determination at determination block 208, 212 or 216 is negative, the remote unit executes an access failure method at process block 218. Figure 6 provides an example of an access failure method that is suitable for use with particular embodiments of the invention. As is evident from Figure 4, the failure access method can return the method to one or more locations in the channel access method. For instance, the access failure method illustrated in Figure 6 returns the method to process block 202 in some instances, process block 204 in other instances and process block 210 in still other instances.

Figure 5 provides an example of an access check method for determining whether a remote unit has accessed a reverse channel 24. The method is initiated at start block 230. At determination block 232, a determination is made whether another remote unit has accessed the reverse channel 24. This determination is made by consulting the B/I bit from the timeslot where the first portion of data is transmitted up to but not including the round-trip timeslot associated with the timeslot where the first portion of data is transmitted. The determination at determination block 234 is negative unless the B/I bit in any of the consulted timeslots 26 indicate that the reverse channel 24 is unavailable. When the determination is positive, it is determined that a remote unit has not accessed the reverse channel at process block 233.

When the determination at determination block 232 is negative, the remote unit proceeds to determination block 234 where a determination is made whether the first portion of data transmitted from the remote unit was successfully decoded. This determination can be made by consulting the round-trip timeslot associated with the timeslot where the first portion of data was transmitted as described above. The determination is positive unless either the B/I bit and the D bit indicate that the data was not received, not decoded or both. When the determination is positive, it is determined that the remote unit has accessed the reverse channel 24 at process block 236. When the determination is negative, it is determined that the remote unit has not accessed the reverse channel 24 at process block 233.

Figure 6 illustrates an access failure method. The access failure method is initiated at start block 270 when the method is accessed after a remote unit failed to access a channel. At determination block 272, a determination is made whether the access failure method has been accessed more than an access failure maximum threshold. When the determination is negative, the remote unit proceeds to process block 274 where the number of times that the failure access method is executed is updated. As described above, the number of times that the failure access method is accessed can be used to determine the second random time.

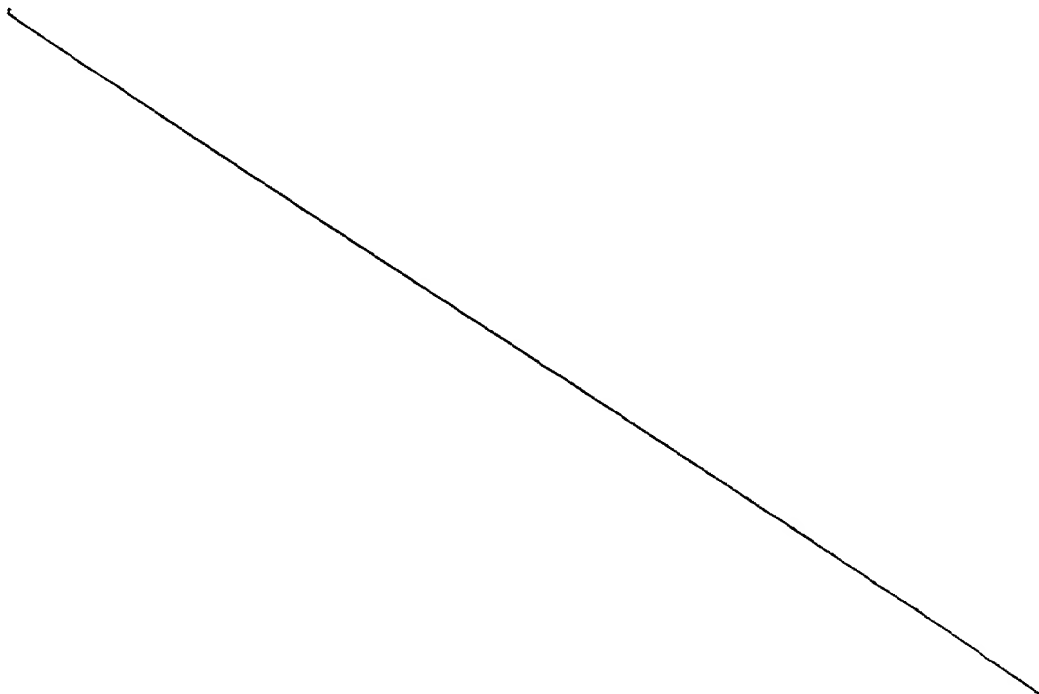
At determination block 276, the remote unit waits a second random time. As described above, the second random time can be a function of the number of times that

the access failure method has been accessed. At determination block 278, the remote unit determines whether the reverse channel 24 is available. This determination is made by consulting the B/I bit once the second random time has expired. When the determination is negative, the method proceeds to return block 286 where the method is returned to process block 204 of Figure 4. When the determination is positive, the method proceeds to return block 280 where the method is returned to process block 210 of Figure 4.

When the determination at process block 272 is positive, the remote unit proceeds to process block 282 where the data packet is discarded. The method proceeds from process block 282 to return block 284. At return block 284, the method is returned to process block 202 of Figure 4.

Other embodiments, combinations and modifications of this invention will occur readily to those of ordinary skill in the art in view of these teachings. Therefore, this invention is to be limited only by the following claims, which include all such embodiments and modifications when viewed in conjunction with the above specification and accompanying drawings.

WHAT IS CLAIMED:



CLAIMS

1. A method for accessing a reverse channel for communication from a remote unit to a base station, comprising:
 - 5 waiting a random period of time in response to determining that the reverse channel is available at a first time;
monitoring a forward channel after expiration of the random period of time to determine whether the reverse channel is available at a second time; and
transmitting to the base station a first portion of data on the reverse channel, the
10 first portion of data being transmitted in response to determining that the reverse channel is available at the second time.
 2. The method of claim 1, wherein the random period of time is a period of time between zero timeslots and an administratively selected number of timeslots.
 - 15 3. The method of claim 1, further comprising:
determining whether the reverse channel stayed available from when the first portion of data is transmitted until a round-trip time has passed, the round-trip time being the time required for a transmission on the reverse channel to be evident on the forward
20 channel.
 4. The method of claim 1, further comprising:
determining whether the reverse channel is available at a round-trip time after transmitting the first portion of data, the round-trip time being the time required for a
25 transmission on the reverse channel to be evident on the forward channel.
 5. The method of claim 1, further comprising:
determining whether the base station successfully decoded the first portion of data.

30

6. The method of claim 1, further comprising:
determining whether transmission of the first portion of data has caused the remote unit to access the reverse channel.

5 7. The method of claim 6, further comprising:
transmitting from the remote unit to the base station a second portion of the data on the reverse channel, the second portion of the data being transmitted in response to a determination that the remote unit has accessed the reverse channel.

10 8. The method of claim 6, further comprising:
performing an access failure algorithm in response to determining that the remote unit has not accessed the reverse channel.

15 9. A method for accessing a reverse channel for providing communication between a remote unit and a base station, comprising:

executing a channel access method to access the reverse channel;

waiting a random time in response to the channel access method failing to provide access to the reverse channel; and

20 re-executing the channel access method in response to a determination that the reverse channel is not available after passage of the random time.

10. The method of claim 9, further comprising:
transmitting from the remote unit to the base station a first portion of data in response to a determination that the reverse channel is available after passage of the
25 random time, the first portion of data being transmitted on the reverse channel.

11. The method of claim 10, further comprising:
determining whether transmission of the first portion of data has caused the remote unit to access the reverse channel.

30

12. The method of claim 9, wherein the random time is between an upper and lower limit, the upper limit being a function of the number of times that the channel access method fails to provide access to the reverse channel.

5 13. The method of claim 9, wherein the random time is between an upper and lower limit, the upper limit being an exponential function of the number of times that the channel access method fails to provide access to the reverse channel.

10 14. The method of claim 9, further comprising:
determining whether the channel access method has failed to provide access to the reverse channel a number of times greater than a failure limit.

15. The method of claim 14, further comprising:
discarding a data packet.

2002-1-24-13:46:50

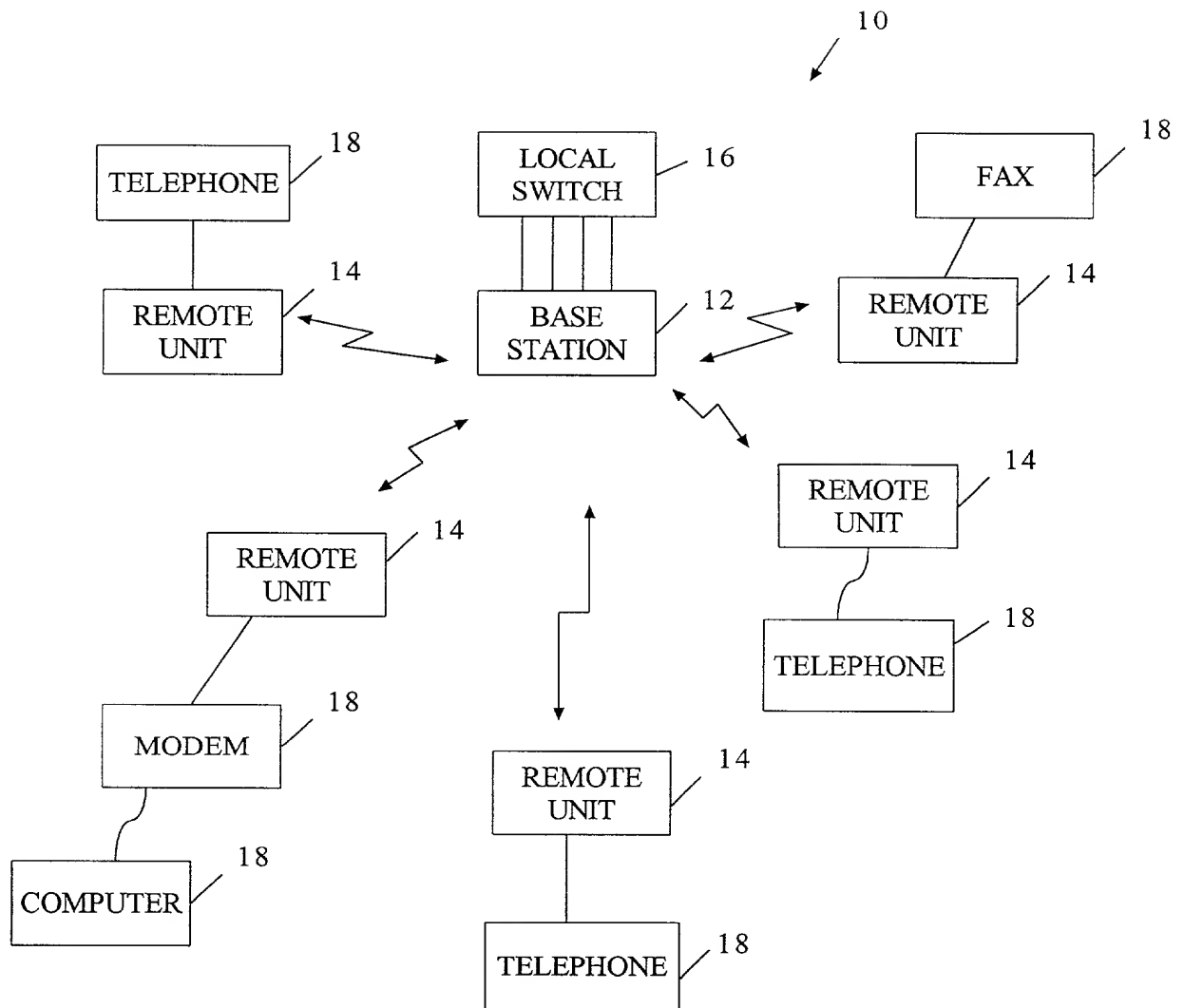


FIGURE 1

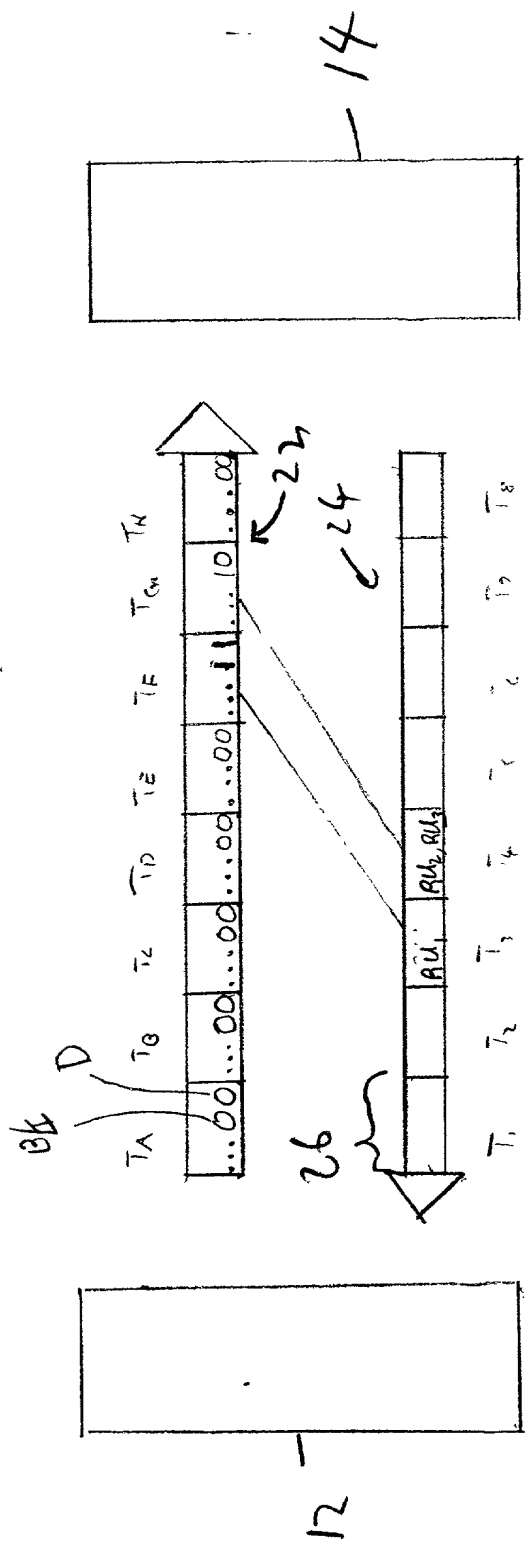


Figure 2

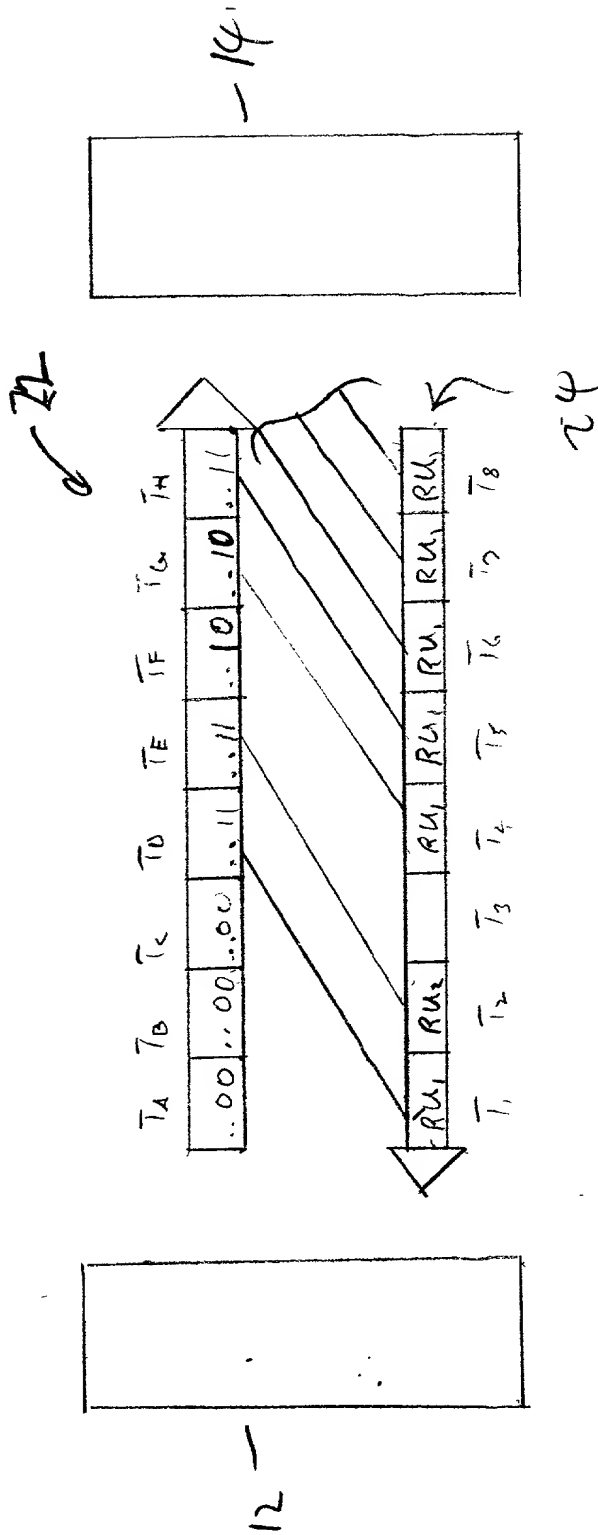


Figure 3

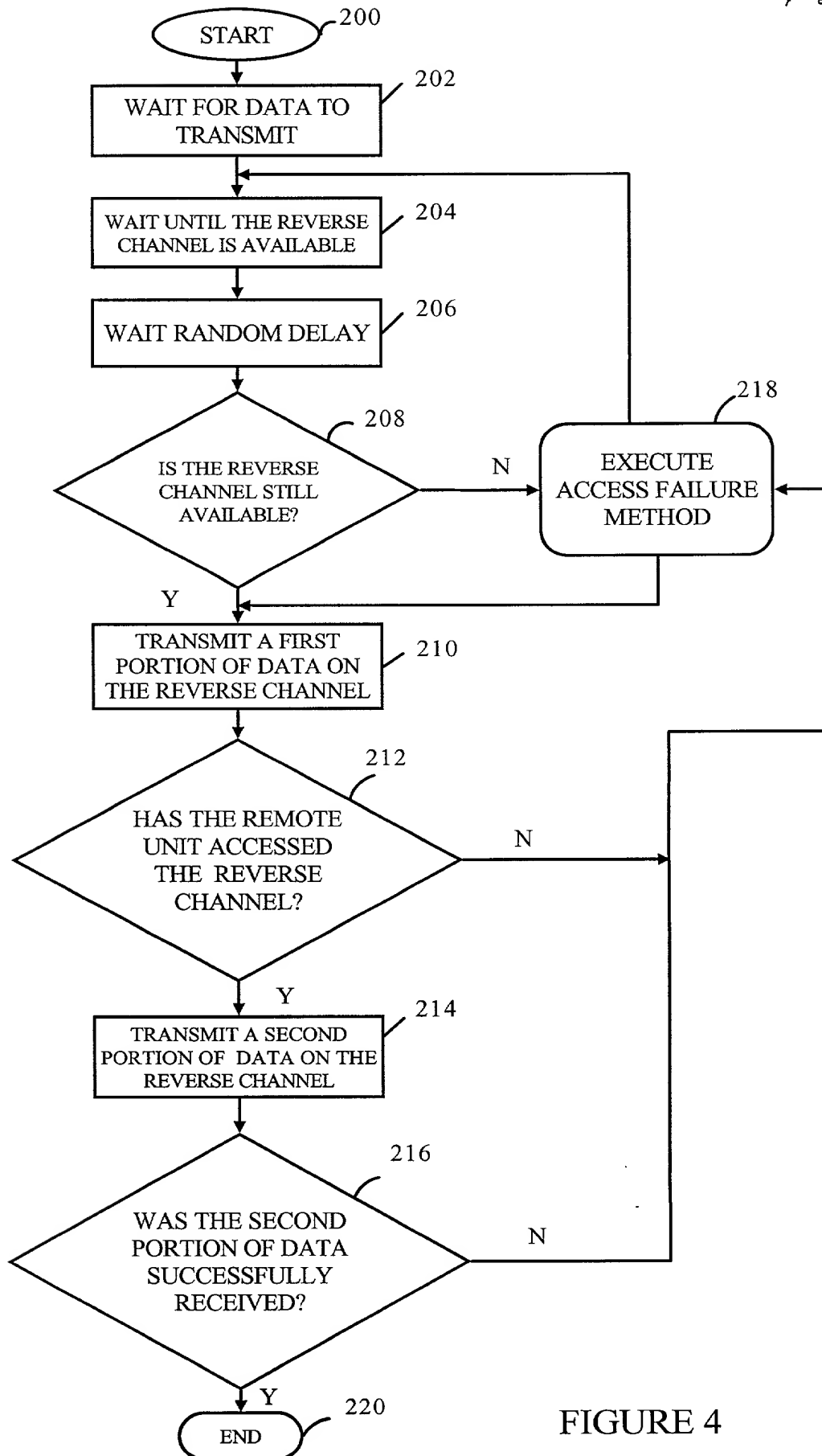


FIGURE 4

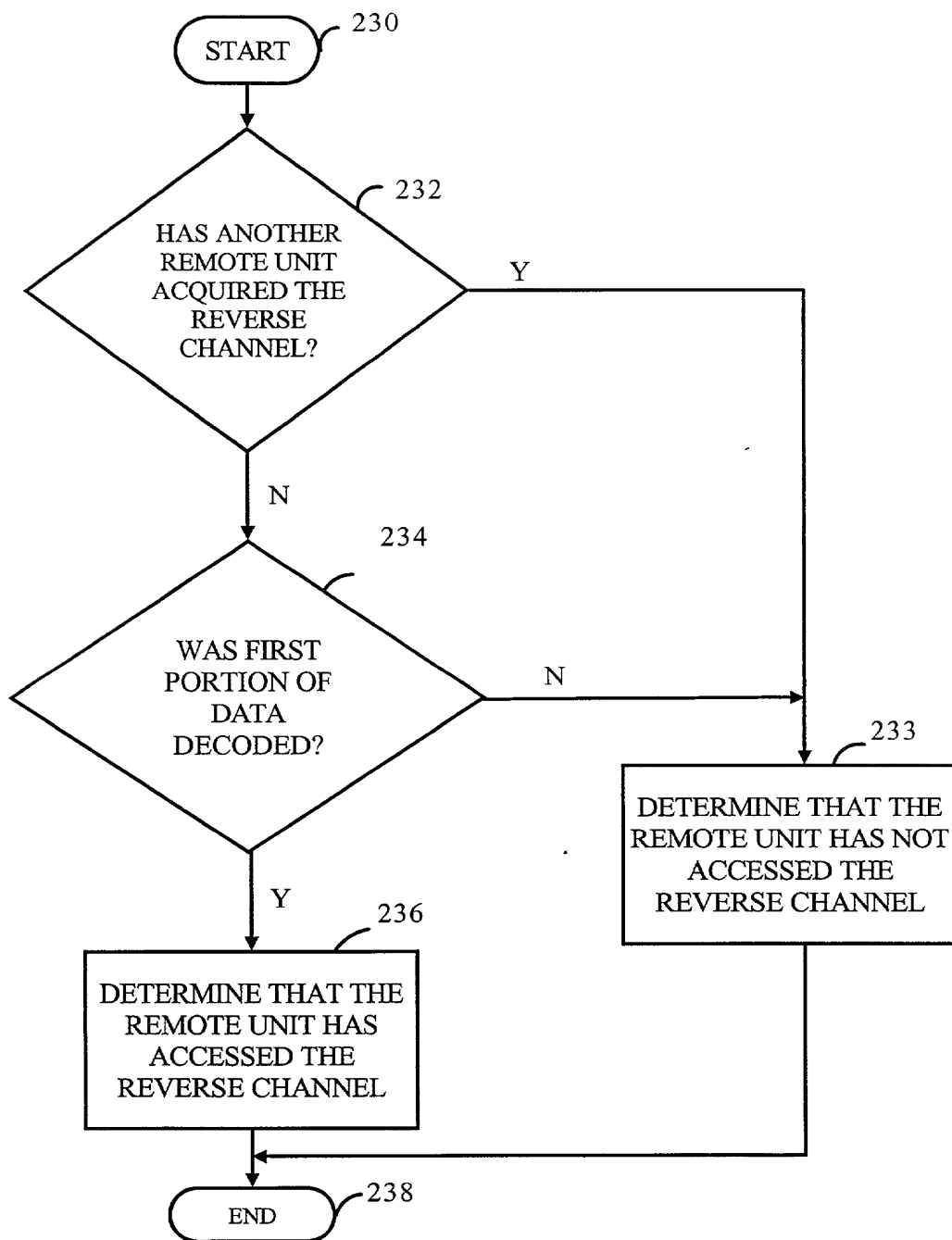


FIGURE 5

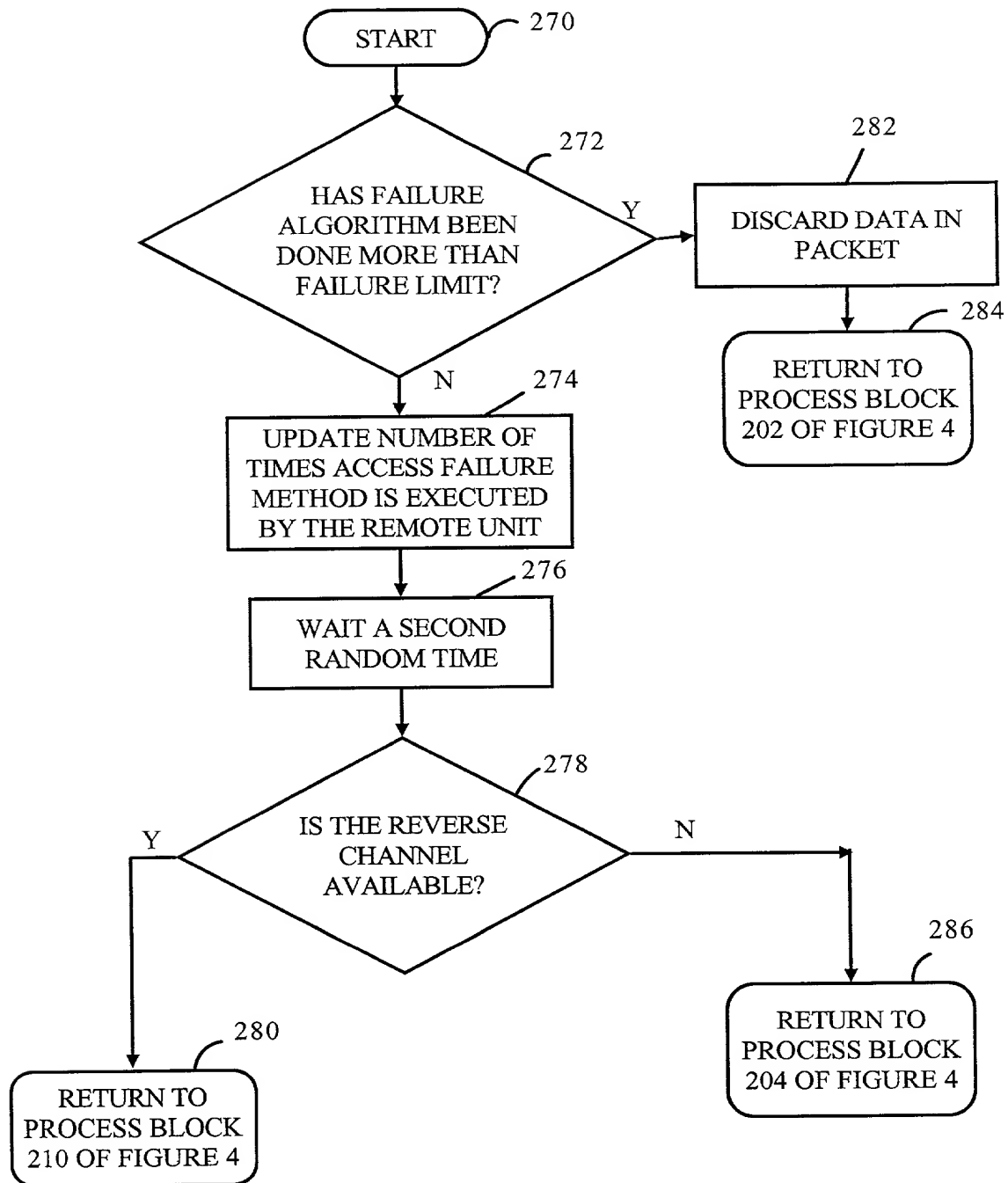


FIGURE 6

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **METHOD AND APPARATUS FOR EFFICIENT SHARING OF COMMUNICATION SYSTEM RESOURCES** the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119(a-d) or 365(a-b) of PCT or foreign application(s) for patent or inventors' certificate listed below or priority benefits under 119(e) of any United States provisional application(s) listed below and have also identified below any foreign application for patent or inventors' certificate having a filing date before that of the application on which priority is claimed:

U.S. Provisional Application No. 60/181,014, Filed February 08, 2000

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, we acknowledge the duty to disclose all information known to us to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

[None]

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

Michele L. Conover	Reg. No. 34,962
Cedric G. DeLaCruz	Reg. No. 36,498
Samuel H. Dworetsky	Reg. No. 27,873
Rohini K. Garg	Reg. No. 45,272
Thomas M. Isaacson	Reg. No. 44,166
Benjamin S. Lee	Reg. No. 42,787
Robert B. Levy	Reg. No. 28,234
Susan E. McGahan	Reg. No. 35,948
Gary H. Monka	Reg. No. 35,390
Jeffrey M. Navon	Reg. No. 32,711
Stephen J. Pentlicki	Reg. No. 40,125
Thomas A. Restaino	Reg. No. 33,444
Alfred G. Steinmetz	Reg. No. 22,971

I also appoint Terrance A. Meador, Reg. No. 30,298; James P. Cleary, Reg. No. 45,843; Charles D. Gavrilovich, Jr., Reg. No. 41,031; Gerald W. Maliszewski, Reg. No. 38,054; John J. Oskorep, Reg. No. 41,234; Steven R. Sprinkle, Reg. No. 40,825; Mark M. Takahashi, Reg. No. 38,631; and Barry N. Young, Reg. No. 27,774 of Gray, Cary Ware & Freidenrich (USPTO Customer No. 25548) as associate attorneys with full power to prosecute said application, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

Please address all correspondence to Mr. S. H. Dworetsky, AT&T Corp., P.O. Box 4110, Middletown, New Jersey 07748-4110. Telephone calls should be made to Thomas M. Isaacson at 301-812-1047. The facsimile number is 732-368-6932.

Full name of 1st joint inventor: **KEVIN M. BOYD**

Inventor's signature _____ Date _____

Residence: Issaquah, King County, Washington, USA

Citizenship: Canada

Post Office Address: 25748 SE 36th Place, Issaquah, Washington 98029

Full name of 2nd joint inventor: **SALVADOR GARCIA, JR.**

Inventor's signature _____ Date _____

Residence: Redmond, King County, Washington, USA

Citizenship: United States

Post Office Address: 12917-179th Avenue NE, Redmond, Washington 98052

Full name of 3rd joint inventor: **EAMONN GORMLEY**

Inventor's signature _____ Date _____

Residence: Seattle, King County, Washington, USA

Citizenship: Ireland

Post Office Address: 909 West Raye Street, Seattle, Washington 98119

Full name of 4th joint inventor: **ANH NGUYEN**

Inventor's signature _____ Date _____

Residence: Seattle, King County, Washington, USA

Citizenship: United States

Post Office Address: 7309-38th Avenue NE #1, Seattle, Washington 98115

COPIES OF THIS DOCUMENT